EXCAVATION SAFETY GUIDELINES

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U.S. General Services Administration
Safety and Environmental Management Branch
1500 East Bannister Road
Kansas City, MO 64131

INTRODUCTION

Many hazards associated with entering and working in excavations and trenches are due, in a large part, to a failure to recognize that excavations present potential hazards where the most serious accidents can ***and do*** occur. Since work in excavations is, and has always been potentially dangerous, General Services Administration (GSA) managers and supervisors must take the time and effort to ensure that working in an excavation is done safely. Successful managers and supervisors will look into the possibility of the most unfavorable situation in every case and take appropriate precautionary measures.

The Occupational Safety and Health Administration (OSHA) has published regulations for excavations; Title 29, Code of Federal Regulations, Parts 1926.650 through 653 (29 CFR 1926.650-653). The criteria contained in the regulations are the basis for the guidelines set forth in this guidance document. Managers and supervisors who insist on compliance with these rules will greatly reduce the chance of an undesirable event occurring in an excavation.

This guidance document is not to be used by contractors entering an excavation under a GSA contract. Contractors must comply with all OSHA standards. The procedures developed or initiated by contractors to comply with standards are their responsibility.

A copy of the OSHA standards applicable to the GSA excavation policy must be available to all supervisors and employees who are required to perform work in conjunction with a permit-required confined space. A copy of 29 CFR 1910.650-653 must be made a part of the local activity confined space entry written procedures.

OSHA standards may be obtained from the local OSHA Area Office or purchased from the Superintendent of Documents, Government Printing Office, Washington, DC 20402.

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1. **POLICY**. All excavating work conducted by or contracted by General Services Administration (GSA) shall be conducted in strict conformance with Occupational Safety and Health Administration (OSHA) regulations. Such regulations include, but are not limited to, those found in Title 29, Code of Federal Regulations, Part 1926.650 thru 653 (29 CFR 1926.650-653), "Excavations."

2. **COMPETENT PERSON**. The term "Competent Person", as pertains to OSHA's excavation standard, means one who is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them. "Authorization" typically is held by the foreman or supervisor of the project. A Competent Person shall be present on-site at any time operations are underway involving employees working or present in an excavation covered by this guidance document.

3. **EXCAVATION SLOPING, BENCHING, AND SHORING REQUIREMENTS**. Employees in an excavation shall be protected by cave-ins by an adequate protective system designed in accordance with the above-referenced OSHA standards. These standards provide exemptions for excavations which are either:

- Made **entirely** in stable rock, as determined by the Competent Person, or

- **Less than 5 feet (1.5 meters)** in depth and where the Competent Person has examined the ground and has determined that **no** potential for a cave-in exists.

a. **Soil Testing**. The Competent Person for the project shall be responsible for the testing of soils of the excavation before personnel are permitted to enter the excavation, or whenever conditions associated with the soil structure change. The results of the soil testing shall be used for determining what worker protective requirements will be used for the excavation. Any conditions which develop that result in a degredation of worker protection will require immediate evacuation of the excavation until

the Competent Person has inspected the excavation and appropriate corrective measures have been accomplished.

b. **Design of Excavations and Protective Systems**. Except as provided herein, all excavations **greater than 5 feet (1.5 meters)** in depth shall be sloped, sloped and benched, or shored. Benching or shoring of the excavations is permitted **ONLY** if designed and constructed in accordance with provisions outlined herein. Excavations deeper than **20 feet (6 meters)** shall be designed **ONLY** by a registered professional engineer (PE). Sloping of the excavation shall be in accordance with one of the following options:

(1) For excavations **less than 20 feet (6 meters)** in depth, the **maximum slope** shall be one and one-half horizontal to one vertical (1-1/2H:1V) (34^{o}), unless the soils are tested and characterized by a Competent Person as outlined in paragraph: SLOPING OF EXCAVATIONS, below. If other procedures for sloping are desired to be used, or for excavations greater than 6 meters in depth, one of the other two options outlined below must be utilized.

(2) The design of the excavation shall be selected from and be in accordance with written tabulated data, such as, charts and tables presented in OSHA 29 CFR 1926.650-653, "EXCAVATIONS". At least one copy of the tabulated data shall be maintained at the jobsite during excavation. The tabulated data shall include:

(a) Identification of the parameters that affect the selection of a sloping or benching system drawn from the data,

(b) Identification of the limits of use of the data, to include the magnitude and configuration of slopes determined to be safe,

(c) Explanatory information as may be necessary to aid the user in correctly selecting a protective system from the data, and

(d) The identity of the registered professional engineer who approved the data.

(3) The sloping or benching system shall be designed by a PE. At least one copy of the design shall be maintained at the jobsite during excavation. Designs shall be in writing and shall include:

(a) The magnitudes and configurations of the slopes that were determined to be safe for the particular excavation, and

(b) The identity of the registered professional engineer who approved the design.

c. **Sloping of Excavations**.

(1) **Testing and Classification of Soils for Sloping**. Each soil and rock deposit shall be classified by a Competent Person as "Stable Rock," "Type A," "Type B," or "Type C" in accordance with the definitions set forth below, unless:

- The excavation is to be **less than 20 feet (6 meters)** in depth **and** the excavation will be sloped to a **maximum** of 1-1/2H:1V (34°), ***or***

- The excavation is to be **less than 5 feet (1.5 meters)** in depth and a Competent Person has examined the ground and has determined that **no** potential for a cave-in exists.

The classification of the deposits shall be made based on the results of at least one visual **and** at least one manual analysis. Such analyses shall be conducted by a Competent Person using tests described in the above-referenced OSHA standard.

(2) **Maximum Allowable Slopes**. If excavations are sloped rather than shored, **continuous** sloping from top to bottom of the excavation to a **maximum** of 1-1/2H:1V (34°) shall be completed, unless the soils are tested and classified. If the soils are tested and classified, the maximum allowable slope to be utilized is indicated in Table 1. The actual slope of the excavation must be **no greater than** the maximum allowable slope indicated in Table 1.

TABLE 1

MAXIMUM ALLOWABLE SLOPES
for
***Simple* Excavations Less Than 20 Feet In Depth**

Rock or Soil Type	Maximum Depth	Maximum Time Excavation Open	Maximum Allowable Slope (4)
Stable Rock	20 Feet (6 Meters)	Not Applicable	Vertical
Type **A** (1)	20 Feet (6 Meters)	Not Applicable	3/4H:1V
Type **A** (1)	12 Feet (3.5 Meters)	24 Hours	1/2H:1V
Type **B** (2)	20 Feet (6 Meters)	Not Applicable	1H:1V
Type **C** (3)	20 Feet (6 Meters)	Not Applicable	1-1/2H:1V

***NOTES*:**

(1) "Type A" means cohesive soils with an unconfined compressive strength of 144 kilopascals (kPa) or greater. Examples of cohesive soils are: clay, silty clay, sandy clay, clay loam and, in some cases, silty clay loam and sandy clay loam. Cemented soils such as caliche and hardpan are also considered Type A. However, no soil is Type A if:

(i) The soil is fissured; or

(ii) The soil is subject to vibration from heavy traffic, pile driving, or similar effects; or

(iii) The soil has been previously disturbed; or

(iv) The soil is part of a sloped, layered system where the layers dip into the excavation on a slope of four horizontal to one vertical (4H:1V) or greater; or

(v) The material is subject to other factors that would require it to be classified as a less stable material.

(2) "Type B" means:

(i) Cohesive soil with an unconfined compressive strength greater than 48 kPa but less than 144 kPa; or

(ii) Granular cohesionless soils including: angular gravel (similar to crushed rock), silt, silt loam, sandy loam and, in some cases, silty clay loam and sandy clay loam.

(iii) Previously disturbed soils except those which would otherwise be classed as Type C soil.

(iv) Soil that meets the unconfined compressive strength or cementation requirements for Type A, but is fissured or subject to vibration; or

(v) Dry rock that is not stable; or

(vi) Material that is part of a sloped, layered system where the layers dip into the excavation on a slope less steep than four horizontal to one vertical (4H:1V), but only if the material would otherwise be classified as Type B.

(3) "Type C" means:

(i) Cohesive soil with an unconfined compressive strength of 48 kPa or less; or

(ii) Granular soils including gravel, sand, and loamy sand; or

(iii) Submerged soil or soil from which water is freely seeping; or

(iv) Submerged rock that is not stable, or

(v) Material in a sloped, layered system where the layers dip into the excavation or a slope of four horizontal to one vertical (4H:1V) or steeper.

(4) The actual slope shall be less steep than the maximum allowable slope when there are signs of distress. If that situation occurs, the slope shall be cut back to an actual slope which is at least one-half horizontal less steep than the maximum allowable slope. When surcharge loads from stored material or equipment, operating equipment, or traffic are present, a Competent Person shall determine the degree to which the actual slope must be reduced below the maximum allowable slope, and shall ensure that such reduction is achieved.

d. **Benching of Excavations**. Benching of a shored excavation, if to be conducted, shall be accomplished following the guidance provided in OSHA 29 CFR 1926.650-653, "EXCAVATIONS".

e. **Shoring of Excavations**. Shoring of an excavation, if to be conducted, shall be accomplished following the guidance provided in OSHA 29 CFR 1926.650-653, "EXCAVATIONS".

4. **SURCHARGE LOADS**. Surcharge loads from adjacent structures shall be evaluated as follows:

a. Where the stability of adjoining buildings, walls, or other structures is endangered by excavation operations, support systems such as shoring, bracing, or underpinning shall be provided to ensure the stability of such structures for the protection of employees.

b. Excavation below the level of the base or footing of any foundation or retaining wall that could be reasonably expected to pose a hazard to employees shall not be permitted except when:

(1) A support system, such as underpinning, is provided to ensure the safety of employees and the stability of the structure; or

(2) The excavation is in stable rock; or

(3) A PE has approved the determination that the structure is sufficiently removed from the excavation so as to be unaffected by the excavation activity; or

(4) A PE has approved the determination that such excavation work will not pose a hazard to employees.

c. Sidewalks, pavements, and appurtenant structures shall not be undermined unless a support system or another method of protection is provided to protect employees from the possible collapse of such structures.

5. **SPOIL PILES**. Excavated or other materials or equipment which may pose a hazard by falling or rolling into excavations shall be placed and kept at least **3 feet (1 meter)** from the edge of the excavation. Alternatively, use of retaining devices which are sufficient to prevent materials or equipment from falling or rolling into excavations may be used. If necessary, **both** of these protective measures may be used.

6. **ACCESS TO AND EGRESS FROM TRENCH EXCAVATIONS**. A stairway, ladder, ramp, or other safe means of egress shall be located in trench excavations that are **4 feet (1.25 meters) or more** in depth. All ladders, stairs, railings, etc. shall be designed by a Competent Person and constructed in strict conformance with OSHA regulations Subparts L (Ladders and Scaffolds) and M (Floors and Wall Openings, and Stairways) to 29 CFR 1926. These means of egress shall be located so as to require **no more than 25 feet (7.5 meters)** of lateral travel for employees exiting an excavation.

a. If ladders are used for egress, the ladder siderails must extend at least **3 feet (1 meter) above** the landing surface. Additionally, the ladder must be secured at its top to a rigid support that will not deflect.

b. If stairs are used for egress, they will be constructed with railings.

c. If ramps are used, employees must be able to walk the ramp in an upright position when entering and exiting the excavation. Additionally, earthen ramps must be evaluated as acceptable by the Competent Person. The following requirements shall be followed for structural ramps and runways:

(1) If structural ramps or runways are constructed of two or more structural members, the structural members shall be connected together to prevent displacement. Connectors, such as cleats or other appropriate means, shall be attached to the bottom of the runway or shall be attached in such a manner to prevent tripping.

(2) Have structural members which are of uniform thickness.

(3) Structural ramps used in lieu of steps shall be provided with cleats or other surface treatments on the top surface to prevent slipping.

7. **HAZARDOUS ATMOSPHERES AND MATERIALS**. If hazardous atmospheres or materials are known or suspected to be present within a trench or excavation, the trench or excavation must be evaluated to determine if it meets the criteria of a permit-required confined space. Refer to GSA Standard Operating Procedure for Confined Space Entry for appropriate practices and procedures. Hazardous atmospheres are those which exposes employees to a risk of death, incapacitation, injury, or acute illness from one or more of the following causes:

a. A flammable gas, vapor, or mist in excess of 10 percent of its lower explosive level or lower flammable limits (LEL/LFL);

b. An airborne combustible dust at a concentration that obscures vision at a distance of five (5) feet or less;

c. An atmospheric oxygen concentration below 19.5 percent or above 23.5 percent.

d. An atmospheric concentration of any substance above its published exposure limits, such as Permissible Exposure Limits (PELs) promulgated by OSHA or Threshold Limit Values (TLVs) issued by the American Conference of Governmental Industrial Hygienists (ACGIH), whichever is more stringent;

e. Any atmospheric condition recognized as immediately dangerous to life and health (IDLH).

8. **EXPOSURE TO VEHICULAR TRAFFIC**. Employees exposed to public vehicular traffic shall be provided with and wear warning vests or other suitable reflectorized or highly-visible garments

9. **EXPOSURE TO FALLING MATERIALS**.

a. No employee shall be permitted underneath loads handled by lifting or digging equipment. Employees shall be required to stand away from any vehicle being loaded or unloaded to avoid being struck by any spillage or falling materials.

b. Adequate protection shall be provided to protect employees from loose rock or soil which could fall from face of the excavation, or fall or roll into the excavation. Such protection may include, but not be limited to:

(1) Scaling loose materials from the face of the excavation.

(2) Installing protective barricades on the face to stop or contain falling materials.

(3) Installing retaining devices on the surface to stop materials or equipment from rolling or falling into the excavation.

(4) Keeping equipment and materials **at least** 2 feet (0.6 meters) from the edge of the excavation.

10. **WATER ACCUMULATION**. Employees shall not be permitted to work in excavations in which there is accumulated water, or in excavations in which water is accumulating, unless adequate precautions have been taken to protect employees against the hazards posed by water accumulation. If water removal equipment is used to prevent accumulation, a Competent Person shall continuously monitor the operation of the water removal equipment during all periods in which personnel are within the excavation. The precautions necessary to protect employees from water accumulation hazards may include, but not be limited to:

a. Water removal equipment.

b. Special support or shield systems.

c. Lifelines and harnesses.

11. **FALL PROTECTION**. Employees or equipment shall not be permitted to cross over excavation unless walkways or bridges with standard guardrails are provided.

12. **INSPECTIONS OF EXCAVATIONS**. Daily inspections of excavations, adjacent areas, and any protective systems shall be conducted by a Competent Person.

a. These inspections shall be conducted at the beginning of each work shift, throughout the work shift as necessary, after every rainstorm, or other hazard increasing occurrence **when** employee exposure can be reasonably be anticipated.

b. These inspections shall be for the purpose of determining if any conditions exist which could result in cave-ins, failure of protective systems, hazardous atmospheres, or other hazardous conditions.

13. **OPEN EXCAVATIONS**. Excavations, regardless of depth, shall not be permitted to remain open during periods when the worksite is unoccupied (i.e., overnight, over a weekend, and other similar off-periods). If the excavation must remain open during periods when the worksite is unoccupied, **lighted** or plastic "safety fence" barricades shall be placed around the excavation in such a manner to alert personnel to the danger and prevent them from falling into the trench.

14. **OVERHEAD UTILITIES**. Clearances to adjacent overhead transmission and distribution electrical lines shall be sufficient for the movement of vehicles and operation of construction equipment. The requirements as stated the National Electric Safety Code shall be followed by the Contractor.

a. Any overhead line will be considered to be energized unless and until the person owning such line, or operating officials of the electrical facility supplying the line, assures that it is not energized and it has been visibly grounded.

b. Work activity which could affect or be affected by overhead lines shall **NOT** be initiated until coordinated with the appropriate utility officials.

c. Operations adjacent to overhead lines are **prohibited unless** at least one of the following conditions is satisfied:

(1) Power has been shut off and positive means taken to prevent the lines from being energized (i.e., lock-out procedures).

(2) Equipment, or any part, does not have the capability of coming within the minimum clearance from energized overhead lines as specified below, or the equipment has been positioned and blocked to assure no part, including cables, can come within the minimum clearances specified in Table 2. A notice of the minimum required clearance has been posted at the operator's position (electric line derrick trucks and aerial lifts are not required to comply with this requirement).

TABLE 2

MINIMUM CLEARANCE from ENERGIZED OVERHEAD ELECTRICAL LINES	
Nominal System Voltage	**Minimum Required Clearance**
0 - 50 kilovolts	10 Feet / 3 Meters
51 - 100 kilovolts	13 Feet / 4 Meters
101 - 200 kilovolts	16 Feet / 5 Meters
201 - 300 kilovolts	20 Feet / 6 Meters
301 - 500 kilovolts	26 Feet / 8 Meters
501 - 750 kilovolts	36 Feet / 11 Meters
751 - 1000 kilovolts	46 Feet / 14 Meters

(3) **In transit**, with boom lowered and no load, the equipment clearance is **at least:**

- 4 feet(1.25 meters) for voltages less than 50 kilovolts (kV), or
- 10 feet (3 meters) for voltages of 50 kV or greater, up to and including 345 kV, or
- 16 feet (5 meters) for voltages greater than 345 kV.

15. **UNDERGROUND UTILITIES**.

a. Work activity which could affect or be affected by underground utilities (gas, electric, water, sewer, telephone, etc.) shall **NOT** be initiated until coordinated with the appropriate utility officials. Contact with ALL affected utility companies may be accomplished through the following telephone numbers:

☎ Missouri:	1-800-DIG-RITE
☎ Kansas:	1-800-DIG-SAFE
☎ Iowa:	1-800-292-8989
☎ Nebraska:	1-800-642-8434

b. Work within an excavation in which utilities are present shall not commence until the hazardous energy associated with those utilities has been properly secured. Refer to GSA Standard Operating Procedure for Controlling Hazardous Energy Sources for proper practices and procedures.